

CLAIMS

We claim:

1. A coupler comprising:
  - a saddle;
  - 5 a channel, wherein said channel comprises a first end having a substantially elliptical cross-section connected to said saddle and a second end having a substantially circular cross-section;
  - a tissue clamp positioned around said channel; and
  - a flange formed adjacent to said second end of said channel.
- 10 2. The coupler of claim 1, wherein said tissue clamp comprises a shape-memory alloy.
3. The coupler of claim 2, wherein said shape-memory alloy comprises a nickel titanium alloy.
4. The coupler of claim 1, wherein said tissue clamp comprises a plurality of teeth positioned along a periphery of said tissue clamp.
- 15 5. The coupler of claim 1, wherein said tissue clamp comprises a plurality of dimpled holes formed therethrough.
6. The coupler of claim 1, wherein a cross-sectional area of said channel remains substantially constant as said channel transitions from said first end to said second end.
7. The coupler of claim 1, wherein a cross-sectional area of said channel increases or
- 20 decreases as said channel transitions from said first end to said second end.
8. The coupler of claim 1, further comprising a mating surface formed adjacent to said flange.
9. The coupler of claim 1, wherein said tissue clamp comprises a pair of legs, which extend and position said tissue clamp adjacent to said saddle when said tissue clamp is heated
- 25 to a transition temperature.
10. The coupler of claim 1, wherein said tissue clamp is made from a material having an austenitic transition temperature less than about 10°C.
11. The coupler of claim 1, wherein said tissue clamp is made from a material having an austenitic transition temperature about equal to or slightly greater than body temperature.
- 30 12. The coupler of claim 10, wherein said material is nitinol.
13. A method of connecting two conduits comprising the steps of:
  - positioning a first saddle of a first coupler within a first conduit;
  - positioning a second saddle of a second coupler within a second conduit;

clamping said first conduit to said first saddle of said first coupler;  
clamping said second conduit to said second saddle of said second coupler;

and

connecting said first coupler and said second coupler.

5 14. The method of claim 13, further comprising the step of making an incision in said first conduit and positioning said saddle of said first coupler within said first conduit.

15. The method of claim 13, further comprising the step of making an incision in said second conduit and positioning said saddle of said second coupler within said second conduit.

10 16. The method of claim 13, wherein the step of clamping said first conduit to said first saddle comprises the step of heating a first tissue clamp to a transition temperature, such that said first tissue clamp secures said first conduit between said first tissue clamp and said first saddle.

15 17. The method of claim 13, wherein the step of clamping said second conduit to said second saddle comprises the step of heating a second tissue clamp to a transition temperature, such that said second tissue clamp secures said second conduit between said second tissue clamp and said second saddle.

20 18. The method of claim 13, wherein the step of clamping said first conduit to said first saddle comprises the step of extending a pair of legs formed in said first tissue clamp, such that said first tissue clamp secures said first conduit between said first tissue clamp and said first saddle.

19. The method of claim 13, wherein the step of clamping said second conduit to said second saddle comprises the step of extending a pair of legs formed in said second tissue clamp, such that said second tissue clamp secures said second conduit between said second tissue clamp and said second saddle.

25 20. The method of claim 13, wherein the step of connecting said first coupler and said second coupler comprises the steps of:

positioning a first flange of said first coupler in alignment with a second flange of said second coupler; and

30 crimping a clamping ring around said first flange and said second flange to secure said first coupler and said second coupler together.

21. The method of claim 20, wherein the step of positioning a first flange of said first coupler in alignment with a second flange of said second coupler comprises the step of

engaging a first mating surface of said first coupler and a second mating surface of said second coupler.

22. The method of claim 13, wherein the step of connecting said first coupler and said second coupler precedes the steps of positioning said first saddle and said second saddle in 5 said first conduit and said second conduit, respectively.

23. A conduit coupling device comprising:

a first coupler comprising a first saddle, a first channel, a first tissue clamp, and a first flange;

10 a second coupler comprising a second saddle, a second channel, a second tissue clamp, and a second flange;

a clamping ring for securing said first flange and said second flange together.

24. The conduit coupling device of claim 23, wherein said first channel and said second channel have substantially constant cross-sectional area.

15 The conduit coupling device of claim 23, wherein said first channel and said second channel have varying cross-sectional areas.

26. The conduit coupling device of claim 23, further comprising a first mating surface formed adjacent to said first flange and a second mating surface formed adjacent to said second flange.

27. The conduit coupling device of claim 23, wherein said first tissue clamp and said 20 second tissue clamp comprise a shape-memory alloy.

28. The conduit coupling device of claim 23, wherein each of said first tissue clamp and said second tissue clamp comprise a plurality of dimpled holes formed therethrough.

29. The conduit coupling device of claim 23, wherein said first tissue clamp and said second tissue clamp comprise a plurality of teeth positioned along a periphery of said first tissue clamp and said second tissue clamp.

30. The conduit coupling device of claim 23, wherein said first channel comprises a first end of substantially elliptical cross-section connected to said first saddle and a second end of substantially circular cross-section adjacent to said first flange.

31. The conduit coupling device of claim 23, wherein said second channel comprises a first end of substantially elliptical cross-section connected to said second saddle and a second end of substantially circular cross-section adjacent to said second flange.

32. The conduit coupling device of claim 23, wherein said first coupler may be positioned at varying positions relative to said second coupler, so that said first saddle and said second saddle may be positioned at varying positions relative to one another.

33. The conduit coupling device of claim 23, wherein said first channel comprises a first 5 end of substantially circular cross-section connected to said first saddle and a second end of substantially circular cross-section adjacent to said first flange.

34. A coupler holder and delivery device for holding and delivering a coupler into a blood vessel, said coupler comprising a saddle; a channel, wherein said channel comprises a first end connected to said saddle and a second end; a tissue clamp positioned around said 10 channel; and a flange formed adjacent to said second end of said channel, said coupler holder and delivery device comprising:

an outer tube surrounding an inner shaft, such that said outer tube is slidable on said inner shaft and independently of said inner shaft;

a coupler conforming end, which is mounted on a first end of said inner shaft and is 15 adapted to engage said second end of said channel of said coupler; and

a pair of opposing, tissue clamp receiving flanges mounted on opposite sides of a first end of said outer tube and adapted to engage said tissue clamp bend said tissue clamp away from said saddle, wherein said outer tube is slidable toward said first end of said inner shaft to engage said flanges to said tissue clamp, and wherein said outer tube is slidable away from 20 said first end of said inner shaft to release said tissue clamp from said flanges.

35. A method for delivering a coupler into a blood vessel, said coupler comprising a saddle; a channel, wherein said channel comprises a first end connected to said saddle and a second end; a tissue clamp positioned around said channel; and a flange formed adjacent to said second end of said channel, said method comprising the steps of:

25 engaging said channel of said coupler;

engaging said tissue clamp and bending said tissue clamp away from said saddle;

making an incision into said blood vessel;

delivering said coupler into said blood vessel through said incision;

securing said saddle to said blood vessel; and

30 releasing said tissue clamp, so that said tissue clamp conforms to said saddle.